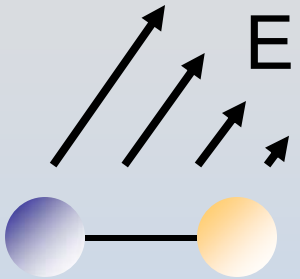
Concept Question: Dipole in Non-Uniform Field

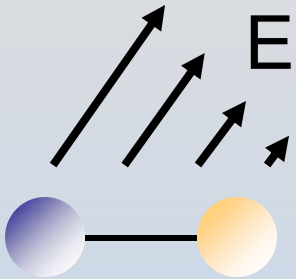


A dipole sits in a non-uniform electric field E

Due to the electric field this dipole will feel:

1. force but no torque
2. no force but a torque
3. both a force and a torque
4. neither a force nor a torque

Concept Question Answer: Non-Uniform Field



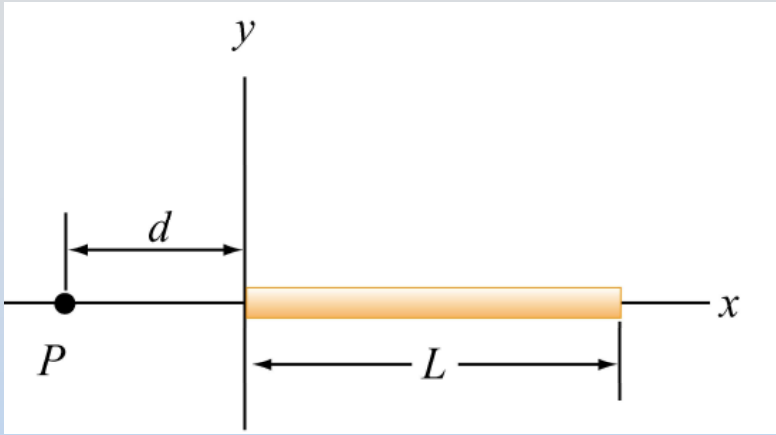
Answer: 3. both force and torque

Because the field is non-uniform, the forces on the two equal but opposite point charges do not cancel.

As always, the dipole wants to rotate to align with the field – there is a torque on the dipole as well

Concept Question Electric Field of a Rod

A rod of length *L* lies along the *x*-axis with its left end at the origin. The rod has a *uniform* charge density λ. Which of the following expressions best describes the electric field at the point *P*



1. $\vec{\mathbf{E}}(P) = -\int_{x=0}^{x=L} \frac{\lambda dx}{(x-d)^3}\hat{\mathbf{i}}$

2. $\vec{\mathbf{E}}(P) = \int_{x=0}^{x=L} \frac{\lambda dx}{(x-d)^3}\hat{\mathbf{i}}$

3. $\vec{\mathbf{E}}(P) = -\int_{x=0}^{x=L} \frac{\lambda dx}{(x-d)^2}\hat{\mathbf{i}}$

4. $\vec{\mathbf{E}}(P) = \int_{x=0}^{x=L} \frac{\lambda dx}{(x-d)^2}\hat{\mathbf{i}}$

5. $\vec{\mathbf{E}}(P) = -\frac{\lambda L}{(d-x)^2}\hat{\mathbf{i}}$

6. $\vec{\mathbf{E}}(P) = \frac{\lambda L}{(d-x)^2}\hat{\mathbf{i}}$

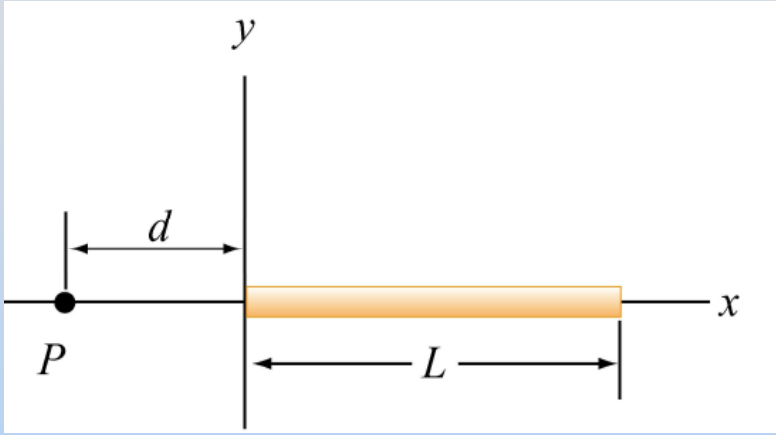
7. $\vec{\mathbf{E}}(P) = -\frac{\lambda L}{d^2}\hat{\mathbf{i}}$

8. $\vec{\mathbf{E}}(P) = \frac{\lambda L}{d^2}\hat{\mathbf{i}}$

9. None of the above.

Concept Question Electric Field of a Rod: Answer

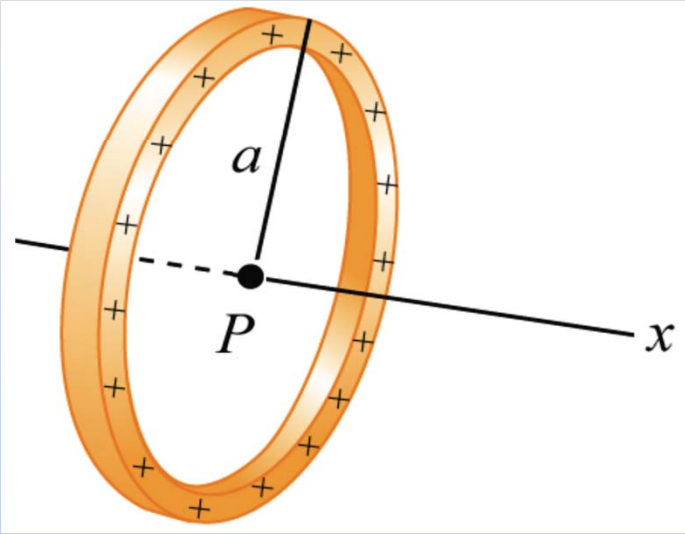
A rod of length *L* lies along the *x*-axis with its left end at the origin. The rod has a *uniform* charge density λ. Which of the following expressions best describes the electric field at the point *P*



5. $\vec{\mathbf{E}}(P) = -\dfrac{\lambda L}{(d-x)^2}\hat{\mathbf{i}}$

Concept Question Electric Field of a Ring

A uniformly charged ring of radius a has total charge Q. Which of the following expressions best describes the electric field at the point *P* located at the center of the ring?



1. $\vec{\mathbf{E}}(P) = -\int_{\theta=0}^{\theta=2\pi} \frac{\lambda a d\theta}{a^3}\hat{\mathbf{i}}$

2. $\vec{\mathbf{E}}(P) = \int_{\theta=0}^{\theta=2\pi} \frac{\lambda a d\theta}{a^3}\hat{\mathbf{i}}$

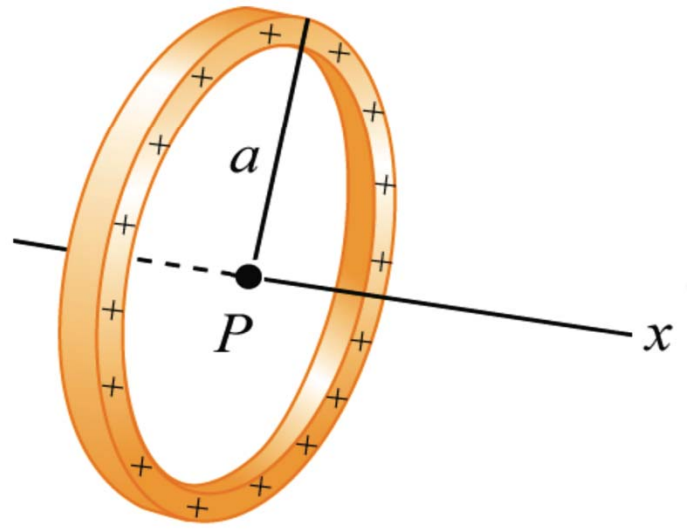
3. $\vec{\mathbf{E}}(P) = -\frac{Q}{a^2}\hat{\mathbf{i}}$

4. $\vec{\mathbf{E}}(P) = +\frac{Q}{a^2}\hat{\mathbf{i}}$

5. $\vec{\mathbf{E}}(P) = \vec{\mathbf{0}}$

Concept Question Electric Field of a Ring: Answer

A uniformly charged ring of radius a has total charge Q. Which of the following expressions best describes the electric field at the point *P* located at the center of the ring?



5. $\vec{\mathbf{E}}(P) = \vec{\mathbf{0}}$